Implications for optical identifications of QSO absorption systems from galaxy evolution models

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Abstract. We have made an attempt to compile all currently available data on optically identified QSO absorber systems (Lindner *et al.* 1996) to establish the status quo of absorber galaxy data as a basis for the investigation of galaxy evolution. We present a first comparison with results from our galaxy evolutionary synthesis models to demonstrate the potential power of this kind of approach and to guide future observations to identify absorber galaxies.

1 Introduction and preliminary results

Our chemical and spectral synthesis model (Fritze – von Alvensleben *et al.* 1994) describes the evolution of various types of galaxies (E to Sd) with appropriate star formation histories and supplies us with time dependent values of luminosities from UV to NIR, colors and metallicities of model galaxies. Adopting any cosmological model characterized by H_0, Ω_0, Λ_0 and the redshift of galaxy formation z_{form}, these results can be transformed into redshift dependent quantities. Apparent R magnitudes as a function of redshift z calculated with this model are plotted in Fig. 1.

Pioneering work in the optical identification of QSO absorption systems was done by Bergeron & Boissé (1991) and up to now, there are more than a dozen of publications reporting on photometric data, equivalent widths and impact parameters for absorbing galaxies. All available data on apparent R magnitudes are plotted in Fig. 1. Different symbols correspond to different authors. Absorbing galaxies with spectroscopically confirmed redshifts (i.e. $z_{\rm gal} = z_{\rm abs}$) are marked by filled symbols, whereas open symbols indicate absorber candidates.

Accounting for the luminosity ranges from the luminosity functions of the various galaxy types (cf. $2\sigma_R$ bars in the lower right corner of Fig. 1) we can state that virtually all observational data points fall between the curves for E– and Sd–models and, accordingly, we can establish global agreement between our galaxy evolution models and observational data up to $z \approx 2$.

Most of the absorber galaxies appear to be early through intermediate type spirals (Sa–Sbc) but many ellipticals and some late type spirals seem to be present, too. The presence of intermediate and late type galaxies among QSO absorbers would imply that a considerable fraction of these galaxies do have extended gaseous halos metal rich enough to cause detectable absorption.

Varying the cosmological parameters we find that e.g. model galaxies for $\mathrm{H}_0 = 50$ km s^{-1} Mpc^{-1} and $\Omega_0 = 0.1$ are much too faint as compared to observations leading us to exclude this compination of cosmological parameters.

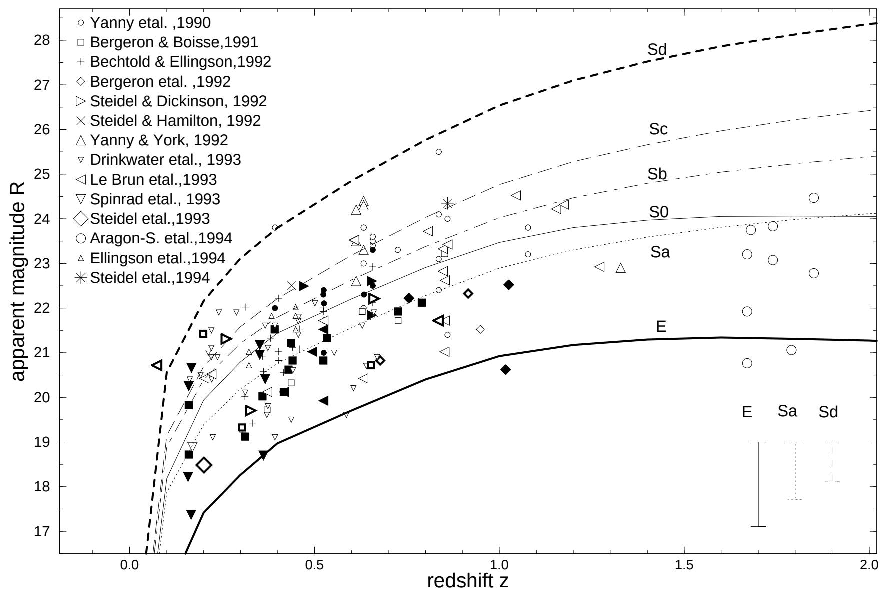

Fig. 1. Apparent R magnitude as a function of redshift for observational data and results from our galaxy evolution model using $z_{\mathrm{form}} = 5$ and cosmological parameters $H_0 = 50$ km s^{-1} Mpc^{-1}, $\Omega_0 = 1$, and $\Lambda_0 = 0$.

2 Outlook and VLT perspective

Unfortunately, data are very inhomogeneous at present. Measurements in different passbands, i.e. colors, from present day instruments are needed. FORS attached to the VLT will provide deeper imaging ($24 < R < 26$) to detect intermediate and late type spiral galaxies in the redshift range $1 < z < 2$ and the MOS unit of FORS will allow to spectroscopically confirm absorber candidates in the magnitude range $22 < R < 24$ (cf. Fig. 1).

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References

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